REMARKS

Claims 1–6, 8–13, 15, and 16 are pending in this application. By this Amendment, claims 1 and 15 are amended. The amendments to claims 1 and 15 are made solely to improve the clarity of the claims, and not for reasons relating to patentability. Support for the amendments to claims 1 and 15 can be found, for example, in original claims 1 and 15. Additional support may be found in the specification, for example, on page 7, lines 4–6. No new matter is added. In view of the foregoing amendments and following remarks, reconsideration and allowance are respectfully requested.

Applicants thank Examiner Williams for the courtesies extended to Applicants' representative during the September 14, 2006 personal interview. The substance of the interview is incorporated into the following Remarks.

Rejection Under 35 U.S.C. §103

The Office Action rejects claims 1–6, 8–13, 15, and 16 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,076,593 to Sullivan et al. ("Sullivan") in view of RO 117023 to Anglitoiu et al. ("Anglitoiu"). Applicants respectfully traverse this rejection.

Claim 1 recites "[a] piston seal used for a caliper body for a disc brake, wherein the piston seal fluid-tightly and slidably maintains a piston in a cylinder bore, the piston sliding inside the cylinder bore, and the piston is rolled back, wherein the piston seal is formed of an ethylene propylene rubber composition comprising at least 100 parts carbon black per hundred parts rubber" (emphasis added).

The Office Action correctly recognizes that Sullivan fails to teach the composition of the seal as required by claim 1. The Office Action asserts that Anglitoiu cures this deficiency. Applicants respectfully disagree with this assertion.

Anglitoiu is drawn to a rubber composition used in high temperature resistant conveyor belts. This rubber composition comprises the following: (1) 100 parts of a polymer based on 70–100 parts ethylene-propylene rubber, up to 30 parts butyl rubber, up to 30 parts

chlorinated butyl rubber, and up to 30 parts polyisobutyl rubber; and (2) 90 parts of additive mixtures of 30–100 parts HAF carbon black, up to 80 parts white fillers selected from talc, chalk, kaolin, and calcium salts;, up to 60 parts aromatic hydrocarbon oils, and up to 60 parts paraffin oils. *See* Anglitoiu at Abstract. For the reference of the Examiner, an English translation of Anglitoiu is attached hereto.

At the very least, the rubber composition of Anglitoiu does not meet the compositional requirements cited in claim 1 "wherein the piston seal is formed of an ethylene propylene rubber composition comprising at least 100 parts carbon black per hundred parts rubber" (emphasis added). Clearly, "90 parts of additive mixtures of 30–100 parts HAF carbon black" can only contain a maximum of 90 parts carbon black per hundred parts rubber. Claim 1 requires at least 100 parts of carbon black per hundred parts of rubber. Furthermore, nowhere does either Sullivan or Anglitoiu teach or suggest that the carbon black content in the rubber composition could or should be increased such that there is at least as much carbon black by weight as rubber by weight, as claimed. Therefore, as agreed during the interview, Anglitoiu does not cure the defect of Sullivan.

For at least these reasons, the claims are patentable over Sullivan in view of Anglitoiu. Reconsideration and withdrawal of the rejection are respectfully requested.

The Office Action reasserts the Examiner's position from the previous Office Action that "each of the recited limitations" in claims 2–6 can be interpreted as an engineering design choice "since the applicant has not disclosed the limitations as solving any specific problem or are for any particular purpose... it appears that the seal of Sullivan et al. as modified by Anglitoiu et al. would have performed equally well when having been designed within the range of each of the recited limitation." *See* Office Action, page 3, lines 11–17. Because claims 2–6 depend from claim 1, and because claim 1 is patentable over the references applied in the current Office Action, for the reasons discussed above, it is not necessary to

particularly address this assertion. However, because it is apparent that the same rationale may be used regardless of the prior art applied, Applicants believe that addressing these assertions at this time may help expedite further prosecution of the application.

A piston seal in a disc brake has two important functions: 1) sealing brake fluid, and 2) returning or "rolling back" the piston. *See* Specification, page 1, lines 15–17. Piston seals are subjected to high temperature due to frictional heat created by operation of the brake. *Id* at page 1, line 27, to page 2, line 2. As the temperature increases, the piston seal thermally expands and the modulus of elasticity of the seal decreases. *Id* at page 2, lines 2–4. Thermal expansion leads to a decrease in the sealing properties of the seal, and a decrease in the modulus of elasticity decreases the ability of the seal to roll back the piston, thus giving a driver an unnatural feel when operating the brakes. *See*, e.g., *Id* pages 2–3. Other important considerations for the composition of a piston seal are hardness and mechanical strength. *Id* at page 3, lines 7–10.

Therefore, the problem that concerned the Applicants was a composition for a piston seal on a disc brake with a lower coefficient of linear expansion, and, over a given temperature range, a smaller change in its dynamic modulus of elasticity. At the same time, the composition has to have the requisite hardness and mechanical strength.

Applicants discovered a seal made of a rubber composition, meeting certain compositional requirements, that exhibits improved characteristics in the areas described above. For example, applicants discovered that reducing the percentage of the rubber polymer in the rubber composition reduces the coefficient of linear expansion of the compound. *Id* at page 3, lines 7–10; page 6, line 24, to page 7, line 6. The Applicants also discovered that if the carbon black used in the rubber composition has an average particle diameter of 40 nm to 500 nm (as required by claim 2), the hardness and mechanical strength of the seal meets the desired results. *Id* at page 3, lines 5–10; page 7, lines 18–25. If the

carbon black has a nitrogen adsorption specific surface area of 70 m^2/g or less (as required by claim 3), the hardness and mechanical strength of the seal meets the desired results. *Id* at page 3, lines 13–18; page 7, line 25, to page 8, line 5.

Applicants further determined that the rubber composition of the piston seal needs to have a coefficient of linear expansion of 1.6×10^{-4} /K or less (as required by claim 4). *Id* at page 3, lines 17–18; page 9, lines 2–6. Applicants also determined that the rubber composition needs to have a dynamic modulus of elasticity of at least 12 MPa at 10 Hz and 30°C (low temperature) and at 10 Hz and 150°C (high temperature) (as required by claim 5). *Id* at page 3, line 23, to page 4, line 3; page 9, lines 6–14. Furthermore, the rate of change in the dynamic modulus of elasticity between the temperature range of 30°C and 150°C could not be greater than ± 25% (as required by claim 6). *Id* at page 4, lines 4–9; page 9, lines 15-20.

The Examples and Comparative Examples provided in the specification, and Table 1, which summarizes the results, clearly demonstrate how the composition of the rubber compound (parts of ethylene propylene rubber and parts of carbon black), and the physical characteristics of the carbon black (HAF carbon black compared to MT carbon black) produce piston seals with different characteristics. From reading the specification, one of ordinary skill in the art would immediately appreciate the problems concerning the applicants, and how the requirements of the claims directly provide solutions to those problems.

In Chapter 2100 of the MPEP, there is only one mention of the term "design choice." This is found under MPEP §2144.04 titled "Legal Precedence as Source of Supporting Rationale," and more particularly under subheading (VI)(c) titled "Rearrangement of Parts." The reference is to *In re Kuhle*, where the particular placement of a contact in a conductivity measuring device was held to be an obvious matter of design choice. 526 F.2d 553, 188 USPQ 7 (CCPA 1975). MPEP §2144 provides that an examiner may use legal precedent as a

rational for an obviousness rejection only "if the facts in a prior legal decision are sufficiently similar to those in an application under examination." MPEP §2144 further provides that "[i]f the applicant has demonstrated the criticality of a specific limitation, it would not be appropriate to rely solely on case law as the rationale to support an obviousness rejection."

Applicants respectfully submit that they have met their burden in establishing the criticality of the recited features of the claimed invention. Accordingly, the Examiner cannot rely on legal precedent as the rationale to support an obviousness rejection of claims 2–6.

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 1–6, 8–13, 15, and 16 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,

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Attachment:
English Translation of RO 117023 B1

Date: September 20, 2006

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ROMANIA

[18] STATE OFFICE FOR TRADE MARKS AND INVENTIONS
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[11] Patent No. 117023 B1
[51] Int. Cl.[7] C 08 L 23/16

[12] PATENT OF INVENTION

The decision to grant the patent of invention may be revoked within the period of 6 months following the date of publication

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[54] RUBBER COMPOSITION CONTAINING ETHYLENE PROPYLENE RUBBER

[57] Abstract: The invention relates to a rubber composition containing ethylene-propylene rubber used to obtain conveyor belts which are resistant to temperature, and states that these constitute 100 parts of polymer comprising 70-100 parts of ethylene propylene rubber, up to 30 parts of butyl rubber, up to 30 parts of chlorobutyl rubber, up to 30 parts of polyisobutyl rubber and up to 90 parts of additives comprising 30-100 parts of activated carbon black of the HAF type, up to 80 parts of white fillers selected from talc, chalk, kaolin and/or calcite, up to 60 parts medium aromatic oil, up to 60 parts paraffin oil, the parts being expressed by weight. Additives and vulcanizing agents known in the art are added to this composition. In the vulcanized state the rubber mixture has a minimum ultimate tensile strength of 12.5 N/mm^2, an elongation on failure of at least 300% and a maximum abrasion resistance of 200 mm^3.

Claims: 2

This invention relates to a rubber composition containing ethylene-propylene rubber of the EPDM type used to obtain conveyor belts resistant to high temperatures.

A rubber composition which is used to obtain conveyor belts which are resistant to high temperatures comprising 50 parts by weight ethylene propylene rubber of the EPDM type, 25 parts by weight of butyl rubber of the Polysar Butyl 402 type, 25 parts by weight of chlorobutyl rubber of the Polysar Chlorobutyl CB1240 type, 50 parts by weight of active carbon black of the HAF type, 54 parts by weight of talc, 8 parts by weight of low molecular mass polyisobutyl rubber of the Oppanol B3 type, 1.5 parts by weight of stearin, 0.2 parts by weight of tetramethyl thiuram disulfide Th, 1 part by weight of dibenzthiazyl disulfide DM, 1 part by weight of ethylene thiourea, 1 part by weight of quinone dioxime accelerator, GMF, 0.25 parts by weight of N-cyclohexyl-2-benzthiazyl sulfenamide accelerator CBS, and 0.6 parts by weight of sulfur S is known.

The composition prepared as above has the disadvantage that it uses a large proportion of butyl rubber, has poor flow properties, is expensive, has the risk of incorporating air during processing, and has low viscosity.

A rubber composition containing ethylene-propylene rubber according to the invention in order to produce conveyor belts which are resistant to temperature overcomes the disadvantages of known compositions in that it comprises 100

parts of polymer comprising 70-100 parts of ethylene propylene rubber, up to 30 parts of butyl rubber, up to 30 parts of chlorobutyl rubber, up to 30 parts of polyisobutyl rubber and up to 90 parts of additives comprising 30-100 parts of activated carbon black of the HAF type, up to 80 parts of white fillers selected from talc, chalk, kaolin and/or calcite, up to 60 parts of medium aromatic oil, up to 60 parts of paraffin oil, the parts being expressed by weight.

In the vulcanized condition it has an ultimate tensile strength of at least 12.5 N/mm^2, an elongation on failure of at least 300% and a maximum abrasion resistance of 200 mm^3.

To this is added 0.5-3 parts by weight of stearin or fatty acids, 3.5-6 parts by weight of zinc oxide ZnO, up to 2.5 parts by weight of N-isopropyl-N-phenyl-p-phenylene diamine type 4010 Na anti-ozone agent, up to 2.5 parts by weight of phenyl-β-napthylamine antioxidant PBN, up to 20 parts by weight of phenol formaldehyde resin Vulkadur A, up to 2 parts by weight of paraffin, using a vulcanizing system with 0.4-2.5 parts by weight of tetramethyl thiuram disulfide Th, 1-2 parts by weight of sulfur S, up to 1.5 parts by weight of ethylene thiourea ETU, 0.4-2 parts by weight of 2-mercaptobenzthiazol accelerator M, up to 1 part by weight of dibenzthiazyl disulfide DM.

The butyl rubber is of the Polysar Butyl 402 type, the chlorobutyl rubber is of the Polysar Chlorobutyl CB 1240 type, the carbon black is of the HAF type, the paraffin oil is of

the UPS type, the medium aromatic oil is Teleajen oil, the polyisobutyl rubber is of the Oppanol B3 type and has a low molecular mass.

The invention has the following advantages:

- it has good preworkability
- it reduces the amount of butyl and chlorobutyl rubber
- it has a lower price
- it has excellent resistance to high temperatures (130-160°C) in the vulcanized state.

One embodiment of the invention is provided below as follows:

Each component was weighed out as follows: 80 kg of ethylene propylene rubber EPDM, 75 kg of activated carbon black HAF, 42 kg of paraffin oil UPS, 0.3 kg of stearin, 4 kg of zinc oxide ZnO, 1.2 kg of paraffin, 9 kg of Oppanol B 3, 1.2 kg of paraphenylene-β-naphthylamine antioxidant PBN, 1.1 kg of vulcasit M, 1.1 kg of vulcasit Th, 1.1 kg of sulfur S.

The composition was made up in a 230 L mixer as follows: the polymer was mixed for 1 to 3 minutes, the carbon black, paraffin oil, paraffin, stearin, PBN antioxidant, zinc oxide and Oppanol were added and mixed for 1 minute to 1 minute 30 seconds, vulcasit Th, vulcasit M and sulfur were added and mixed for 20 to 30 seconds.

The temperature of the mixer was held at 100°C.

The mixture was discharged from the mixer into an 84"

mixing mill where it was homogenized for a period of 4 to 5 minutes. The mixture was drawn from the mixing mill in the form of a sheet, talc-coated, cooled and placed on pallets.

The mixers had the following dimensions: 660 x 610 x 2130 mm.

The physical and chemical properties of the composition in the vulcanized state are included in Table 1:

Table 1

Property	Specified value	Value found	Method of test
1. Ultimate tensile strength (N/mm^2)	12.5	13.2	SR ISO 37/97
2. Elongation on failure (%), min.	300	410	SR ISO 37/97
3. Abrasion resistance, mm^3, max.	200	170	STAS 6689/89
4. Resistance to accelerated ageing (168 hours x 160°C)			STAS 5152/74 (method using a circulating air stove)
a) Decrease in ultimate tensile strength, %, max.	60	9.4	
b) Increase in Shore A hardness	10	10	

CLAIMS

1. A rubber composition containing ethylene-propylene rubber, elastomers, additives, for obtaining conveyor belts which are resistant to temperature, wherein it comprises 100 parts of polymer comprising 70-100 parts of ethylene propylene

rubber, up to 30 of butyl rubber, up to 30 parts of chlorobutyl rubber, up to 30 parts of polyisobutyl rubber and up to 90 parts of additives comprising 30-100 parts of activated carbon black of the HAF type, up to 80 parts of white fillers selected from talc, chalk, kaolin and/or calcite, up to 60 parts of medium aromatic oil, up to 60 parts of paraffin oil, the parts being expressed by weight.

2. The composition as claimed in claim 1, wherein in the vulcanized condition it has a minimum ultimate tensile strength of 12.5 N/mm^2, a minimum elongation on failure of 300% and a maximum abrasion resistance of 200 mm^3.

Chairman of the inventions committee: **Ing. Stella Florea**

Examiner: **Ing. Daniela Teodorescu**